

Recent Advances in Science in Western Australia

Earth Sciences

Palaeomagnetic dating of dolerite dykes and sills in the Mesoproterozoic Albany Mobile Belt and Neoproterozoic Stirling Range Formation by researchers from the University of Western Australia provides evidence for extensional events between Australia, east Antarctica and Greater India. Three periods of dyke and sill intrusion are distinguished. The first, earliest Cambrian, phase took place during crustal extension between the Yilgarn and east Antarctic cratons and is related to Gondwana assembly. A second phase of mid-Carboniferous dykes and a third, possibly Triassic, phase are related to rifting and extension between Greater India and the Western Australian Shield during early stages in the formation of the Perth Basin.

Harris LB & Li Z X 1995 Palaeomagnetic dating and tectonic significance of dolerite intrusions in the Albany Mobile Belt, Western Australia. *Earth and Planetary Science Letters* 131:143-164.

Lithographic strata of the traditional "laterite profile" (*i.e.* pallid zone, mottled zone, laterite, 'residual' sand) and late Cenozoic valley fills of the "palaeodrainage system" (*i.e.* hardpan, calcrete, alluvium, colluvium) throughout the Yilgarn Sandland Region have been re-interpreted to be mainly desert-aeolian sediment. The traditional approaches used to resolve the origin of these units (*e.g.* photogeology, geomorphology, pedology, geochemistry) are concluded by the authors to be largely inappropriate and to have resulted in models that incorrectly interpret "laterite profile" units solely as deeply weathered basement rocks. If the regolith is to be correctly interpreted, then the authors suggest that the traditional residual and "locally reworked" views, and the alternative aeolian views, need to be investigated and critically appraised from the perspective of sedimentary geology.

Glassford D K & Semeniuk V 1995 Desert-aeolian origin of late Cenozoic regolith in arid and semi-arid Southwestern Australia. *Palaeogeography, Palaeoclimatology, Palaeoecology* 114:131-166.

Intracratonic sedimentation started in the onshore northern Perth Basin in the Early Permian and continued until the breakup of Gondwana in the early Cretaceous. While mature source rocks are widespread, reservoirs are abundant, and structures are well timed for hydrocarbon entrapment, a critical factor is seal since structures covered by shales that are thinner than the throw of faults may lose their trapping potential. The Allanooka High, Dongara Terrace, Beharra Springs Terrace and Cadda Terrace — with good source rock potential, Early Triassic seals and Late Permian objectives at drillable depths — are thought to offer the best chances for further hydrocarbon discoveries.

Crostella A 1995 An evaluation of the hydrocarbon potential of the onshore Perth Basin, Western Australia. Geological Survey of Western Australia. Report 43.

Potentially economic coal seams in the Permian Irwin River Coal Measures (IRCM) on the Irwin Terrace are described by researchers from the Geological Survey of WA to cover an area of about 170 km². The IRCM and underlying sedimentary rocks constitute a broadly

upward-coarsening glaciomarine alluvial deltaic succession. Most of the coal resources are deep, with possibly 5% lying in the current opencut window. The estimated coal resources are 1000 Mt inferred (Class 1) of the Australian Code. In general, the coal is high in moisture (20-30%), high in volatiles (24-37%), moderate to low in sulphur (0.5%) and moderate to high in ash (7-30%); specific energy is between 16.38 and 21.66 MJ kg⁻¹ on an as-received basis.

Le Blanc Smith G & Mory A J 1995 Geology and Permian coal resources of the Irwin Terrace, Perth Basin, Western Australia. Geological Survey of Western Australia. Report 44.

Groundwater in the Mesozoic and Cenozoic succession is currently exploited to provide about 40% of scheme water to the Perth region; the remainder comes from surface water catchments. Perth will become more dependent on groundwater as urban development continues to expand and the surface catchments become fully utilized. Under present landuse conditions, the maximum projected total and sustainable groundwater from the aquifers in the region would be about 500 10⁶ m³ year⁻¹, and may be raised to 600 10⁶ m³ year⁻¹ with further urban development and increased groundwater recharge from stormwater catchments. The current abstraction rate of about 300 10⁶ m³ year⁻¹ is well within sustainable limits and potential exists for significant additional abstraction.

Davidson W A 1995 Hydrogeology and groundwater resources of the Perth region, Western Australia. Geological Survey of Western Australia. Bulletin 142.

The stromatolite forms *Acaciella australica* and *Basisphaera irregularis* are recorded from the Skates Hill Formation by K Grey of the Geological Survey of WA. These forms support correlation of the unit with the Bitter Springs Formation and other units of Supersequence 1 in the Centralian Superbasin, and indicate a Neoproterozoic age for the Savory Basin succession.

Grey K 1995 Neoproterozoic stromatolites from the Skates Hills Formation, Savory basin, Western Australia, and a review of the distribution of *Acaciella australica*. *Australian Journal of Earth Sciences* 42:123-132.

Life Sciences

The survival of adult western long-billed corellas and Major Mitchell cockatoos, studied in the wheatbelt of Western Australia from 1977 to 1983 by researchers from the CSIRO Division of Wildlife and Ecology (Midland), ranged from 81.3% for female Major Mitchell cockatoos (92.9% for males) to 94.2% for male western long-billed corellas (93.2% for females). The survival of immature birds was lower. This is attributed to predation of immature birds in locally nomadic flocks; immature survival was only slightly negatively affected by dispersal. The populations of both western long-billed corellas and Major Mitchell cockatoos are predicted to be stable, or slowly increasing, as appears to be the case.

Smith G T & Rowley I C R 1995 Survival of adult and nestling western long-billed corellas, *Cacatua pastinator*, and Major Mitchell cockatoos, *C. leadbeateri*, in the wheatbelt of Western Australia. *Wildlife Research* 22:155-162.

A collaborative study by researchers from the Swedish University of Agricultural Sciences and Curtin University of Technology documented the invasion of native sclerophyll woodland vegetation by exotic weed species, after fire, in linear remnants along a highway in south-western Australia. The most common weeds were the perennial grasses *Eragrostis curvula* and *Ehrharta calycina*. The weeds spread mainly from the road side of the linear sclerophyll remnants, rather than the fence side. Grasses are normally an insignificant component of sclerophyll forest, and their presence after fire increases the fire proneness. The impact of fire was still evident after 7 years. Restrictions on the frequency of burning, and on further narrowing of the linear sclerophyll woodland corridors are advocated.

Milberg P & Lamont B B 1995 Fire enhances weed invasion of roadside vegetation in southwestern Australia. *Biological Conservation* 73:45-49.

The relationship between species and genus richness of local Australian ant faunas is examined by A Andersen, of the CSIRO Tropical Ecosystems Research Centre (Winnellie), to test the validity of the hypothesis that higher-taxon categories be used, rather than species, in rapid biodiversity surveys. Although the relationship between species and genus richness was strong within regions for 24 sites distributed throughout Australia, overall it varied substantially and there was only a weak relationship. The relationship was confounded by biogeographic factors and influenced by sampling area and intensity. It is concluded that genus richness of ants is an unreliable substitute for species richness except in limited circumstances, and it is suggested that this conclusion may also apply to other taxa for which a small number of genera can contribute a large number of species.

Andersen A N 1995 Measuring more of biodiversity: genus richness as a surrogate for species richness in Australian ant faunas. *Biological Conservation* 73:39-43.

Estimates by researchers from the Department of Conservation and Land Management, Perth, of the susceptibility to *Phytophthora cinnamomi* of plant species in 63 active disease centres and 17 old centres of *Eucalyptus marginata* forest, north of the Preston River, indicated that the impact was intermediate (scattered deaths) in 46% of the active disease centres and high (most susceptible plants dead) in 29% of active centres, compared to a high impact in 65% in old disease centres. Cross tabulation of species by frequency of death and isolation of

P. cinnamomi from plant and soil allowed the classification of the response of plant species to infection.

Shearer B L & Dillon M 1995 Susceptibility of plant species in *Eucalyptus marginata* forest to infection by *Phytophthora cinnamomi*. *Australian Journal of Botany* 43:113-134.

Researchers from the Department of Conservation and Land Management, Perth, have extended the geographic and host range of the canker fungus *Cryptodiaporthe melanocraspeda*. Large numbers of *Banksia coccinea* were observed dying downward from apical branches, in the south coast region of Western Australia, in 1989; rapid complete death of stands was typical for many diseased stands. Lesions of *C. melanocraspeda* girdled stems and were concluded to be associated with the death of *B. coccinea*. In contrast, the fungi *Zythiostroma* spp, which form lesions that girdle the stems of *B. coccinea*, and *Botryosphaeria ribis*, which forms non-girdling lesions, were considered to be only weak pathogens.

Shearer B L, Fariman R G & Bathgate J A 1995 *Cryptodiaporthe melanocraspeda* canker as a threat to *Banksia coccinea* on the South Coast of Western Australia. *Plant Diseases* 79:637-641.

Note from the Hon Editor: This column helps to link the various disciplines and inform others of the broad spectrum of achievements of WA scientists (or others writing about WA). Contributions to "Recent Advances in Science in Western Australia" are welcome, and may include papers that have caught your attention or that you believe may interest other scientists in Western Australia and abroad. They are usually papers in refereed journals, or books, chapters and reviews. Abstracts from conference proceedings will not be accepted. Please submit either a reprint of the paper, or a short (2-3 sentences) summary of a recent paper together with a copy of the authors' names and addresses, to the Hon Editor or a member of the Publications Committee: Dr S D Hopper (Life Sciences), Dr A E Cockbain (Earth Sciences), and Assoc Prof G Hefter (Physical Sciences). Final choice of articles is at the discretion of the Hon Editor.

"Letters to the Editor" concerning scientific issues of relevance to this journal are also published, at the discretion of the Hon Editor. Please submit a word processing disk with letters, and suggest potential reviewers or respondents to your letter.

P C Withers, *Honorary Editor, Journal of the Royal Society of Western Australia.*